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XXXVI.—*The Classification of the Blennioid Fishes.*
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THE Blennioids may be defined as Percomorphous Teleosts with the pelvic fins jugular or mental, each of a spine and four soft rays or still further reduced, with the dorsal and anal rays typically corresponding in number to the vertebræ, each basal bone attached to its own neural or hæmal spine (rays more numerous in Ophidiiformes), with well-developed wings of the parasphenoid ascending in front of the prootics, and with all or most of the ribs inserted on strong parapophyses. The limits and contents of the group are indicated in the following scheme;—

Order PERCOMORPHI.

Suborder BLENNIOIDEA.

1. *Blenniiformes*: Blenniidæ, Anarrhichadidæ, Congrogadidæ, Notograptidæ.
 2. *Cliniiformes*: Clinidæ, Dactyloscopidæ, Xiphidiontidæ, Stichæidæ, Pholididæ, Lumpenidæ, Microdesmidæ, Ptilichthyidæ, Zoarcidæ, Scytalinidæ, Rhodichthyidæ.
 3. *Ophidiiformes*: Brotulidæ, Ophidiidæ, Fierasferidæ.
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The principal genera usually regarded as Blennioid and now excluded from the group are *Pataecus*, *Acanthoclinus*, and *Gadopsis*.

Pataecus proves to be a Scorpaenoid related to *Gnathanacanthus* (cf. Gill, Proc. U.S. Nat. Mus. xiv. 1891, p. 701).

Acanthoclinus is related to *Plesiops*, differing especially in the absence of a subocular shelf, the increased number of vertebræ and of dorsal and anal spines, the more advanced pelvic fins with fewer rays, the smaller scales, and the additional lateral lines. The pelvic fin of *Plesiops* has a spine and four soft rays, the first long, thick, and bifid, the third and fourth small and slender; that of *Acanthoclinus* differs only in the absence of the two inner rays. *Acanthoclinus indicus*, Day, 1888, has large scales and only one lateral line; I propose for it the new generic name *Acanthoplesiops*.

Gadopsis has the pelvic fins jugular, reduced to a small spine and a bifid ray; the crowding of the posterior dorsal and anal rays, the intervention of the prootic between parasphenoid and alisphenoid, the three anal spines, &c. are against Blennioid relationships; this genus is a Percoid of isolated position.

Division 1. BLENNIIFORMES.

Each basal bone of the dorsal and anal fins attached to its own neural or hæmal spine. Suborbital ring stout, rigid; præorbital expanded inwards and firmly united with the lateral ethmoid; postorbital similarly expanded and solidly united to a lateral expansion of the frontal.

Family 1. Blenniidæ.

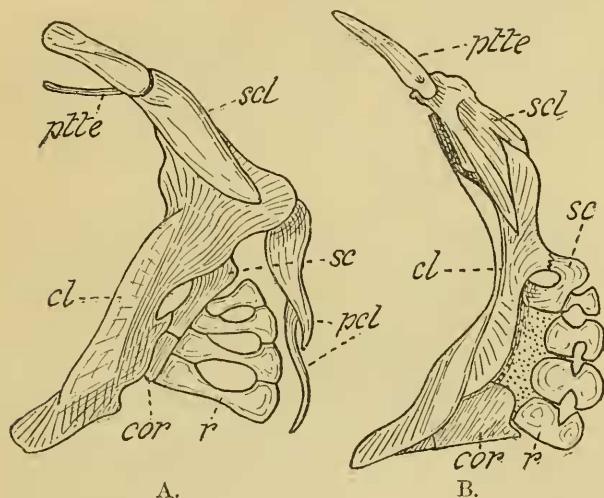
Body naked. Spinous and soft-rayed portions of the dorsal fin subequal; 1 or 2 anal spines; caudal free, with about 13 principal rays; pelvics jugular, each of a small spine and 2 to 4 simple rays. Mouth not protractile; maxillary almost or quite excluded from the gape; jaws with a single series of slender close-set teeth, resembling the teeth of a comb, within which curved canines may be developed; palate usually toothless. Palatines separated by the vomer; pterygoid connecting palatine with quadrate. Parietals separated by the supraoccipital; exoccipital condyles wide apart; skull more or less contracted and compressed immediately behind the postorbital expansions of the frontals; sphenotic remote from the orbit. Post-temporal forked; two post-cleithra on each side; hypercoracoid and hypocoracoid

in contact, narrow, especially the latter, which is not developed below the base of the pectoral fin; radials elongate, 4 in number (fig. 1, A); pelvic bones short, firmly attached at the cleithral symphysis.

Principal genera: *Ophioblennius*, *Blennius*, *Salarias*, *Andamia*, *Chasmodes*, *Petroscirtes*, *Xiphasia*, from tropical and temperate seas.

In *Ophioblennius webbi* I find that the comb-like outer series of teeth is developed, although very small; this genus differs from other Blenniidæ in the presence of symphyseal canines and of more than one lateral canine in the lower jaw. *Xiphasia* has the head, mouth, teeth, gill-openings, &c. of *Petroscirtes*, but differs from that genus in the very long tail and greatly increased number of fin-rays and vertebræ.

Fig. 1.



Pectoral arch of A. *Blennius bufo* and B. *Anarrhichas lupus*.

ptte, post-temporal; *scl*, supra-cleithrum; *cl*, cleithrum; *pcl*, post-cleithrum; *sc*, hypercoracoid; *cor*, hypocoracoid; *r*, radials.

Family 2. Anarrhichadidæ*.

Body naked or with vestigial scales. Dorsal fin formed

* Since this paper was written Dr. Gill has issued a memoir entitled "Notes on the Structure and Habits of the Wolfishes" (Proc. U.S. Nat. Mus. xxxix. 1911, pp. 157-187, pls. xvii.-xxviii.)—a valuable account of the fishes of this family.

entirely of flexible spines; caudal with about 13 principal rays; pelvics absent. Mouth not protractile; præmaxillaries fixed; maxillary entering the gape; jaws with conical canines anteriorly; strong molar teeth at the sides of the lower jaw and on the vomer and palatines; pterygoid connecting palatine with quadrate. Parietals separated by the supraoccipital; exoccipital condyles separate. Post-temporal simple, the lower fork represented by a ligament; no post-cleithra; hypercoracoid and hypocoracoid well developed, widely separated by cartilage; radials plate-like, not elongate (fig. 1, B).

Anarrhichas and *Anarrhichthys*, with a few species, are large fishes of the northern seas. In *Anarrhichas lupus* I count 77 vertebræ (26 + 51), and in the eel-shaped *Anarrhichthys*, with about 250 dorsal rays, there are probably about 250 vertebræ.

L. A. Adams (Bull. Univ. Kansas, 1908, pp. 331-355, pls. xxv.-xxxvi.) has given a detailed description of the skull of *Anarrhichthys*. *Anarrhichas* is very similar, and both show considerable resemblance to *Blennius* in cranial structure.

Family 3. Congrogadidæ.

Body covered with small scales. Caudal of 9 or 10 rays, joined to the dorsal and anal; all the fin-rays articulated, or the first of the dorsal spinous; pelvics, if present, jugular, 1- or 2-rayed, appearing as a pair of filaments. Mouth protractile, with strongly developed lips; maxillary excluded from the gape; jaws with a single series of conical or somewhat compressed teeth; palate usually toothless. Palatines separated by the vomer; pterygoid unconnected with palatine or mesopterygoid, curved backwards above the quadrate (fig. 2, B). Parietals separated by the supraoccipital; exoccipital condyles almost contiguous. Post-temporal forked; hypercoracoid and hypocoracoid in contact, rather narrow; radials small, hourglass-shaped.

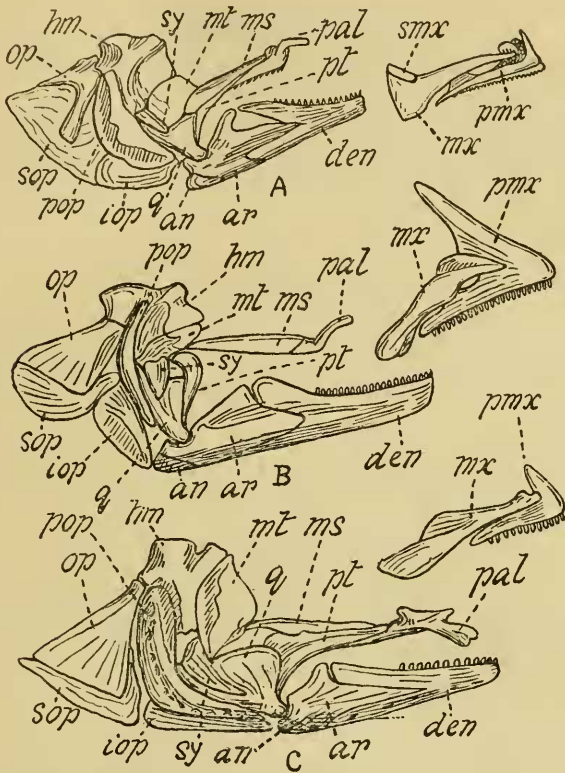
Synopsis of the Genera.

- I. No dorsal spine; gill-membranes united, free from the isthmus; 6 branchiostegals; lateral line incomplete; no pelvic fins.
1. *Congrogadus*.
- II. First dorsal ray a short spine; gill-membranes joined to the isthmus; 4 branchiostegals.
- | | |
|--|--------------------------|
| Lateral line incomplete; pelvic fins present | 2. <i>Blennodesmus</i> . |
| Lateral line complete; no pelvic fins | 3. <i>Haliophis</i> . |
| Three lateral lines; pelvic fins present | 4. <i>Halidesmus</i> . |

Congrogadus (including *Hierichthys*) comprises three species from Japan, the East Indies, and Northern Australia.

Blennodesmus scapularis, Günth., from Rockhampton,

Fig. 2.



Jaws, suspensorium, and opercular bones of A. *Brotula jayakari*,
B. *Congrogadus subducens*, and C. *Zoarces viviparus*.

pmx, præmaxillary; *mx*, maxillary; *smx*, supra-maxillary; *den*, dentary; *ar*, articular; *an*, angulare; *pal*, palatine; *pt*, pterygoid; *ms*, mesopterygoid; *mt*, metapterygoid; *hm*, hyomandibular; *sy*, symplectic; *q*, quadrate; *pop*, præoperculum; *op*, operculum; *sop*, suboperculum; *iop*, interoperculum.

Haliophis maculatus, Rüpp., from the Red Sea, and *Haliodesmus scapularis*, Günth., from Port Elizabeth, resemble each other in the presence of a spot or ocellus above the

pectoral fin, as is indicated by the specific names; all are small littoral forms.

I have examined the skeleton of *Congrogadus subducens*, and I have ascertained that *Halidesmus* agrees with it in the structure of the pterygoid.

Family 4. *Notograptidæ*.

Body covered with small scales. Vertical fins confluent; each dorsal and anal ray, except the last two, which are branched, a slender pointed spine to which a distal filament is attached posteriorly; caudal of 11 branched rays; pelvics small, jugular, 1-rayed, appearing as a pair of simple filaments. Mouth not protractile; a short mental barbel; maxillary excluded from the gape, reduced to a slender rod; broad bands of small pointed teeth in the jaws and on the palatines, which nearly meet in the middle line below the toothless vomer; pterygoid connecting palatine with quadrate. Parietals meeting above the supraoccipital; exoccipital condyles wide apart. Post-temporal forked; hypercoracoid and hypocoracoid well developed, in contact; radials hourglass-shaped.

This family includes but a single species, *Notograptus guttatus*, Günth., represented in the British Museum by three examples from Cape York and Bowen.

Division 2. CLINIFORMES.

Each basal bone of the dorsal and anal fins attached to its own neural or hæmal spine. Suborbital ring laminar, movable. Exoccipital condyles wide apart.

Family 1. *Clinidæ*.

Body usually scaly. Dorsal with spinous portion more extended than the soft, or with all the rays spinous; 1 or 2 anal spines; caudal free, with about 13 principal rays; pectorals broad-based; pelvics jugular, of a spine and 3 or 4 simple articulated rays, 2 or 3 of which are usually thickened, closely articulated and free distally. Gill-membranes united, free from isthmus. Mouth protractile; conical or villiform teeth in jaws and often on vomer and palatines. Suborbitals not stout; præorbital a lamina with a small pit on its upper edge articulating with a small facet on the lateral ethmoid; postorbital a lamina adherent by its upper edge to the skull. Postorbital part of skull of nearly equal width throughout;

parietals separated by supraoccipital; a basisphenoid; parasphenoid meeting alisphenoids; exoccipital condyles wide apart. Post-temporal forked; 2 post-cleithra on each side; 4 flattened radials inserted on hypercoracoid and hypocoracoid, which are in contact and well-developed, the latter continued forward below the base of the pectoral. Pelvic bones erect laminae that meet above and enclose a chamber between them. Vertebrae 34 to 57 (10-22 + 24-35) or more; præcaudals with parapophyses from the sixth or seventh to the last.

The principal genera are: *Heterostichus*, *Clinus*, *Gobioclinus*, *Sticharium*, *Emnion*, *Neoclinus*, *Emblemaria*, *Cristiceps*, *Exerpes*, *Auchenopterus*, *Tripterygium*, *Lepidoblennius*, from tropical and temperate seas.

Family 2. Dactyloscopidæ.

Body scaly; a single lateral line. Dorsal with the spinous portion less extended than the soft; anal long, preceded by 2 spines; caudal free, with 10 or 11 principal rays; pectorals broad-based, somewhat procurvent below; pelvics jugular, each of a small spine and 3 simple articulated rays. Mouth protractile; jaws with bands of cardiform or villiform teeth; palate toothless. Operculum fringed; gill-membranes not united, free from the isthmus. Head-skeleton as in the Clinidæ, except that there is no basisphenoid; parasphenoid meeting frontals. Pectoral arch as in the Clinidæ, except that the hypercoracoid and hypocoracoid are separated and the two lower radials are inserted on the cleithrum (fig. 3, 1); pelvic bones formed exactly as in the Clinidæ.

Four genera: *Gillellus*, *Dactyloscopus*, *Dactylagnus*, and *Myxodagnus*, from the coasts of tropical America.

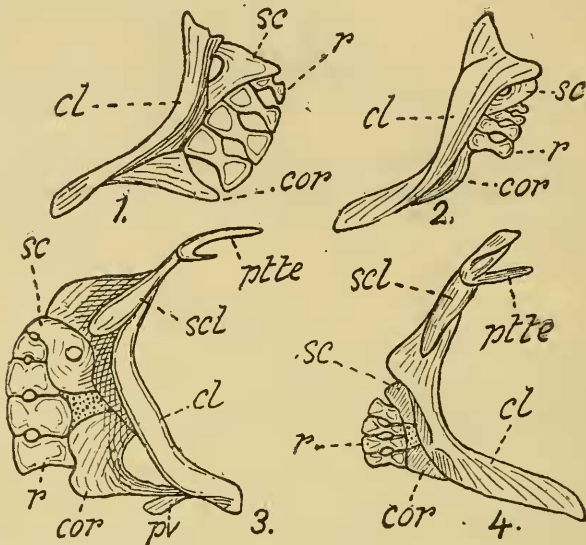
In *Dactyloscopus tridigitatus* I count 46 vertebrae (12 + 34); there are 10 pairs of ribs, the last 7 inserted on parapophyses.

Family 3. Xiphidiontidæ.

Body covered with small scales; 3 or 4 lateral lines with numerous vertical branches. Vertical fins confluent; dorsal formed of spines only; anal long; caudal with 15 branched rays; pectorals small; pelvics absent. Mouth small, scarcely protractile; jaws with conical or villiform teeth and with anterior canines; palate toothless. Gill-membranes united, free from the isthmus. Head-skeleton as in the Clinidæ, except that there is no basisphenoid; parasphenoid meeting

frontals. Pectoral arch much as in the *Dactyloscopidæ*, except that the coracoids and radials are smaller (fig. 3, 2).

Fig. 3.



Bones at base of pectoral fin of 1. *Dactyloscopus tridigitatus* and 2. *Xiphidion chirus*. Pectoral arch of 3. *Zoarces viviparus* and 4. *Brotula jayakari*,

Lettering as in fig. 1; *pv*, pelvis.

Xiphidion comprises a few species, eel-shaped shore-fishes of the North Pacific.

In *Xiphidion chirus* I count 76 vertebræ (24 + 52); parapophyses are developed on the præcaudals from the fourth.

Family 4. *Stichæidæ*.

Body usually scaly. Caudal either free or united with the dorsal and anal, usually with 15 principal rays. Pelvic fins, when present, jugular, with the soft rays normally branched. Parietals separated by supraoccipital; no basi-sphenoid; parasphenoid meeting frontals. Præorbital with an inner shelf attached anteriorly to the posterior face of lateral ethmoid; suborbitals well ossified; exoccipital condyles above the basioccipital, with articulating surfaces looking downwards and backwards; centrum of first vertebra

concave anteriorly; normal parapophyses on most of the præcaudal vertebræ. Post-temporal forked; hypercoracoid and hypocoracoid well-developed, in contact or scarcely separated; radials sometimes hourglass-shaped, but usually rather short and squarish, inserted on the coracoids. Pelvic bones slender, elongate, not expanded vertically.

The numerous genera may be arranged thus:—

I. Dorsal with a posterior soft-rayed portion.

Dictyosoma, Eulophias, Neozarces, Cebedichthys, &c.

II. Dorsal fin of spines only.

Chirolophus, Stathmonotus, Anoplarchus, Opisthocentrus, Plagiogrammus, Stichæus, Dinogunnellus, Cryptacanthodes, &c.

All are inhabitants of Arctic or northern seas.

Family 5. Pholididæ.

Closely related to the Stichæidæ, differing in that the præcaudal parapophyses are united to form closed hæmal arches. The body is elongate, compressed, covered with very small scales; there is no lateral line. The vertical fins are confluent; the dorsal is long and low, of 75 to 100 short spines; the anal, preceded by 1 or 2 spines, is about half as long as the dorsal; the pectorals are rather small, placed low, and the pelvics, when present, are formed each of a spine and one small soft ray. The mouth is rather small, oblique, with conical or villiform teeth in the jaws and sometimes on the palate; the gill-membranes are united, free from the isthmus.

Pholis, Apodichthys, &c., small shore-fishes of Arctic and northern seas.

Family 6. Lumpenidæ.

Differs from the Stichæidæ especially in that the præorbital is represented by the inner shelf only, the suborbitals are not ossified, and the anterior surface of the first vertebra is convex, fitting into the single concavity formed by the basi-occipital and by the laterally placed exoccipital condyles.

The body is very elongate, little compressed, covered with small scales; the lateral line is indistinct or absent. The caudal, of 13 principal rays, is free; the dorsal is long, of 55 to 75 slender spines; the anal, preceded by 2 or 3 spines, is more than half as long as the dorsal; the pectorals are well developed and each pelvic is formed of a spine and 3 or 4 branched rays. The head is longer, the eyes larger, and the mouth less oblique than in the Xiphidiontidæ or Pholididæ;

small conical teeth are present in the jaws and sometimes on the palate; the gill-openings are rather wide, the gill-membranes being joined to the isthmus below the præoperculum.

In *Lumpenus lampetiformis* there are 81 vertebræ (28 + 53); the skull has the interorbital region narrower and the postorbital part shorter and flatter above than in *Chirolophus*, *Dictyosoma*, *Pholis*, &c.

It is doubtful whether more than one genus is really definable: *Lumpenus*, Reinh., with a few species from Arctic and northern seas.

Family 7. *Microdesmidæ*.

Body elongate, covered with small scales; no lateral line. Vertical fins confluent; dorsal long, anteriorly of slender spines, posteriorly of soft rays; anal without spines; caudal of 15 principal rays; pelvics subthoracic, of a small spine and 1 or 2 soft rays. Mouth small, not protractile, terminal, oblique, with the lower jaw prominent; teeth in the jaws only; eyes small; suborbitals apparently not ossified; gill-openings small oblique slits in front of the lower part of the pectorals.

Three species, from the Pacific coast of Tropical America, have been referred to two genera, *Microdesmus* and *Cerdale*. In *Microdesmus dipus*, Günth., I find that each pelvic fin consists of a small spine and 2 soft rays, the outer simple, the inner bifid distally; in some features this species recalls the Stichæid *Cebedichthys*.

Family 8. *Ptilichthyidæ*.

Ptilichthys goodei, Bean, from the North Pacific, has the naked body extremely elongate, tapering posteriorly, without caudal fin; the anterior part of the dorsal fin is formed of short isolated spines, and the soft dorsal and anal are many-rayed; there are no pelvic fins. There is a broad mental barbel; the mouth is terminal, non-protractile; the teeth form a single series in the jaws; the gill-membranes are united but free from the isthmus, and the gill-openings are restricted from above. According to Gilbert* the post-temporal is not forked, but is a very slender bony rod; the coracoids are well-developed and are not separated by cartilage; the radials are large, hourglass-shaped, one on the

* Gilbert, in Jord. & Everm. Fish. N. Amer. iii. pp. 2451-2452 (1898).

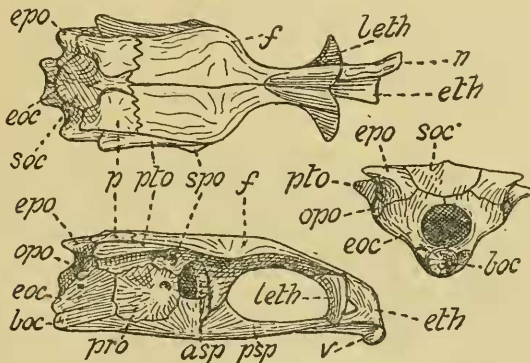
hypercoracoid and three on the hypocoracoid. If, as is probable, the fin-rays correspond to the myotomes, the vertebræ number about 235.

Family 9. Zoarcidæ.

There are no spinous fin-rays, except sometimes a few posterior rays of the dorsal, the ventral fins are confluent and the pelvic fins, when present, are small, jugular. The mouth is non-protractile, the suborbitals are delicate, attached as in the Clinidæ, and the gill-membranes are joined to the isthmus. The width of the gill-openings is extraordinarily variable; in *Melanostigma* they are small foramina, in *Lycodapus* and *Bothrocara* they extend forward to below the eye; other genera are intermediate.

I have examined the skeleton in *Zoarces* and *Lycodes*. The skull is flattish above, with the frontals narrowed between and expanded behind the orbits; the parietals are

Fig. 4.



Skull of *Zoarces viviparus* from above, from the side, and from behind.

n, nasal; *eth*, mesethmoid; *leth*, lateral ethmoid; *v*, vomer; *psp*, parasphenoid; *asp*, alisphenoid; *f*, frontal; *p*, parietal; *soc*, supraoccipital; *eoc*, exoccipital; *boc*, basioccipital; *pro*, prootic; *spo*, sphenotic; *pto*, pterotic; *epo*, epiotic; *opo*, opisthotic.

separated by the supraoccipital, which has a feeble crest or none; the exoccipital condyles are widely separated and the wing of the parasphenoid meets a descending process of the frontal; the opisthotic is small, the pterotic elongate, and the sphenotic not very prominent. These features are shown in the figures of the skull of *Zoarces viviparus* (fig. 4), from

which *Lycodes frigidus* differs chiefly in the greater length of the narrow orbital portion of the frontals. The jaws, suspensorium, and opercles (fig. 2, C) are much as in the Stichæidæ, as is the pectoral arch except for the separation of the coracoids by cartilage (fig. 3, 3). The vertebræ are numerous, 112 (24+88) in *Zoarces* and 102 (22+80) in *Lycodes*; strong transverse processes are present on the præcaudals from the first to the last; the ribs are slender.

A variety of forms, chiefly from Arctic and northern seas, but with Antarctic representatives also.

The principal genera are: *Zoarces*, *Lycodes*, *Embryx*, *Lycodopsis*, *Aprodon*, *Lycenchelys*, *Lycodonus*, *Lycanema*, *Melanostigma*, *Gymnelis*, *Bothrocar*, *Lycodapus*, *Phucocætes*, *Ilucetes*, *Platea*, *Maynea*.

Lycodapus, Gilbert, includes small deep-sea fishes of the North Pacific, and has been made the type of a distinct family and placed near the Fierasferidæ. But the head and mouth recall those of *Lycodopsis* or *Bothrocar*, the gill-membranes join the isthmus between the rami of the lower jaw (at least in *L. fierasfer*), and the dorsal and anal rays correspond in number to the myotomes.

Two other aberrant genera, *Scytalina* and *Rhodichthys*, are closely related to the Zoarcidæ, but may for the present be regarded as the types of separate families.

Family 10. Scytalinidæ.

Scytalina cerdale is a small eel-like fish known only from specimens obtained on the shores of Waadda Island, in the Straits of Juan de Fuca, where it lives in the wet shingle. The very small eyes placed far forward and the tumid cheeks give it a physiognomy unlike that of the Zoarcidæ; the gill-membranes are united, but not joined to the isthmus; the pectoral fins are small and the pelvics absent. The skull is much more depressed than that of *Zoarces* or *Lycodes*, the frontals gradually increase in breadth backwards, and the union of the parasphenoid and frontals is very elongate, almost as in the Symbranchidæ. The parietals, occipital and otic bones are much as in *Zoarces*; the suspensorium, opercles, and pectoral arch are also as in *Zoarces*, except that the very small coracoids are in contact; the vertebræ number 69 (22+47); strong transverse processes are present on the præcaudals from the third to the last.

Family 11. *Rhodichthyidæ*.

Rhodichthys regina is known to me only from Collett's description and figures* of the type, 297 mm. in total length, from the depths of the North Atlantic; it is a very remarkable fish, naked, translucent, and bright red in colour; it agrees with the *Zoarcidæ* in the restricted gill-openings, the jugular position of the pelvic fins, and the correspondence between the fin-rays and the myotomes. The vent is placed at the throat and each pelvic fin is a long bifid filament, characters which indicate that this fish should probably rank as the type of a separate family.

Division 3. OPHIDIIFORMES.

Dorsal and anal basalia outnumbering the corresponding neural or hæmal spines. Suborbital ring, when ossified, as in the *Cliniiformes*. Operculum V-shaped. No spinous fin-rays. Exoccipital condyles meeting above the basioccipital; anterior face of first centrum convex, fitting the slight concavity of the basioccipital.

The three families have also the following characters in common:—

Pelvic fins, when present, jugular or mental, close together, each of 1 or 2 filamentous rays. Teeth cardiform or villiform, in bands in the jaws and usually on the vomer and palatines; præmaxillaries with short ascending processes; maxillaries well developed, expanded behind. Palatine with a maxillary process; pterygoid normally connected with palatine and quadrate; hyomandibular very broad; operculum V-shaped, the upper fork usually forming a sharp spine; suboperculum large; 6 to 8 branchiostegals. Cranium elongate, with the postorbital portion longer than the orbito-rostral and the parasphenoid united with the frontals in front of the pro-otics and alisphenoids; ethmoid keeled. Post-temporal more or less distinctly forked; coracoids weakly ossified; pectoral radials 4, moderate. First two vertebræ short; third with a sessile rib, which is expanded to support the air-bladder.

Family 1. *Brotulidæ*.

The pelvic fins, when present, are jugular and the vent is remote from the head. As a rule the long dorsal and anal

* Norwegian N. Atlantic Exped. Fish. p. 153, pl. v. (1880).

fins are confluent with the reduced caudal, but the latter may be well-developed and free (*Dinematichthys*) or may be absent. The gill-openings are wide, with the gill-membranes separate and free from the isthmus (except in *Dermatopsis*). The mouth is usually protractile.

This family includes the blind cave-fishes of Cuba (*Stygicola* and *Lucifuga*) as well as a number of marine forms, some of those inhabiting the depths of the sea being extraordinarily aberrant (*Tauredophidium*, *Aphyonus*, *Typhlonus*, *Acanthonus*, &c.). Many have been described by Günther ('Challenger' Deep-sea Fishes), and Goode and Bean ('Oceanic Ichthyology') give a useful synopsis of the genera.

I have examined the skeleton of *Brotula jayakari*, and I have already figured the skull (Ann. & Mag. Nat. Hist. (7) xi. 1903, p. 461). The parietals are separated by the supra-occipital, the latter forms with the exoccipitals a strong median crest which does not project above the level of the upper surface of the skull, the opisthotic is not enlarged, the basioccipital and pro-otic form a rather prominent auditory bulla.

The structure of the jaws, the hyo-palatine and opercular bones (fig. 2, A), and the pectoral arch (fig. 3, 4) is shown by the figures; the lower fork of the post-temporal is directly attached to the opisthotic, and the hypercoracoid and hypocoracoid are separated by cartilage.

In *Brotula jayakari* there are 55 vertebræ (15 + 40); the first two vertebræ are short and bear sessile epipleurals; the third, fourth, and fifth bear sessile ribs, the first two pairs being expanded; from the sixth to the fifteenth the ribs are borne by strong transverse parapophyses.

Emery has figured the suspensorium of *Pteridium atrum**, but I find that his figure is incorrect and that the pterygoid, mesopterygoid, and metapterygoid are exactly as in *Brotula*; he has overlooked the suture between pterygoid and mesopterygoid, and has mistaken the anterior part of the metapterygoid for the latter bone.

Family 2. Ophidiidæ.

Differ from the preceding externally in the anterior position of the pelvic fins, inserted between the rami of the lower jaw; behind them the gill-membranes are attached to the isthmus. I have examined the skeleton of *Genypterus blacodes*, which differs from that of *Brotula* especially in the

* Fauna u. Flora d. Golf. v. Neapel, ii. (1880).

ankylosis of the pterygoid and mesopterygoid, and the prolongation forwards of the cleithra within the isthmus as a pair of slender processes, with the pelvic bones attached at their extremities. The lower fork of the post-temporal is shortened and attached to the opisthotic by a ligament, and the coracoids are in contact. There are 72 vertebræ (20 + 52): the first five are as in *Brotula*, except that only the first rib is expanded; the anterior six pairs of parapophyses (on vertebræ 6-11) are strong and broad, much as in *Merluccius*, the rest are normal.

Principal genera: *Ophidium*, *Otophidium*, *Lepophidium*, *Genypterus*, from tropical and temperate seas, some inhabiting deep water.

Dereiodichthys, Gilbert, from the North Pacific, has the mouth non-protractile, the body naked, and the gill-openings more restricted than the others; it may not pertain to this family and may prove to be related to the Zoarcidæ.

Family 3. Fierasferidæ.

Differ externally from the Brotulidæ in that the anal fin extends further forward and the vent is placed at the throat, caudal and pelvic fins are absent*, and the mouth is non-protractile. The cranium shows many striking resemblances to that of *Brotula*, but differs in that the parietals meet above the supraoccipital, the occipital crest is weak, and the exoccipitals do not take part in its formation, and the enlarged opisthotic reaches the basicoccipital, sharing with that bone and the pro-otic in the formation of the auditory bulla †. The lower fork of the post-temporal is reduced to a little knob; otherwise the pectoral arch is as in *Genypterus*. In *Fierasfer acus* (fide Emery) the vertebræ number 125 to 144, of which 17 or 18 are præcaudal; in *F. dentatus* there are 26 præcaudal vertebræ; the first rib is more strongly expanded in the former species than in the latter.

Seeing that the Fierasferidæ had always been placed near the Optidiidæ, and that Emery's anatomical researches confirmed this view as to their systematic position, it is not

* I at one time thought that a reduced homocercal fin was present in some Fierasferidæ, as in the Brotulidæ; but on looking into the matter I find that whenever a caudal fin appears to be present it is due to regeneration after the end of the tail has been broken off.

† These features were first described by Emery (Faun. u. Flora d. Golf. v. Neap. ii. 1880), and I am able to confirm the accuracy of his account of the head-skeleton, after preparing and examining that of *F. acus*.

easy to understand Boulenger's transference of the family to the Heteromi, with which they have practically nothing in common.

There are two genera, *Fierasfer* and *Jordanicus*, widely distributed in tropical and temperate seas.

XXXVII.—*Two new West-African Mammals.*

By OLDFIELD THOMAS.

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Mungos phœnicurus, sp. n.

A small species with the terminal pencil of the tail rich reddish.

General appearance that of the members of the *gracilis* group of the genus, apart from the red tail-tip. Colour most nearly approaching that of a pale Lake Zuai specimen of *M. gracilis*, far paler than the West-African *M. melanurus*. General colour of back approaching "clay-colour," paler and more buffy on the shoulders, more rufous on the posterior back. Head as usual greyer than back, but still with a buffy tone in it. Sides grizzled buffy. Under surface uniform buff, the throat more "cream-buff." Hands and feet dull buffy, rather darker than "cream-buff." Tail coarsely grizzled with black and buffy above, uniform ochraceous buff below; the full terminal pencil deep tawny rufous.

Dimensions of the type (measured in the flesh):—

Head and body 330 mm.; tail 289; hind foot 61; ear 28.

Skull: condylo-basal length 68·3; zygomatic breadth 33·5; palatal length 35·4; greatest diameter of p^4 7·7.

Hab. Panyam, Bauchi Province, N. Nigeria. Alt. 4000'.

Type. Old male. B.M. no. 12. 7. 9. 2. Collected 12th February, 1912, and presented by the late Rev. G. T. Fox.

The only other known mungoose with a red tail-tip is *M. sanguineus*, Rüppell, of Kordofan, which is considerably smaller (hind foot 50–54 mm.), is lighter coloured throughout, and has the under surface white instead of buffy.

In Mr. Wroughton's monograph of this group he assigned to *M. sanguineus* an example from Suakin with the tail-tip "half chocolate-brown and half black," but the conspicuous and evidently natural red tail-tip of the N. Nigerian species leads me to think that *sanguineus* has also a really red tail-tip and that the Suakin specimen is merely one of the ordinary